Algebra Revision Mat

Expanding Brackets

1) (2x + 3)(x + 8) $2x^2 + 19x + 24$

2) (3x – 2)(4x - 1) $12x^2 - 11x + 2$

3) (x + 3)(x + 1)(x – 2)
$x^3 + 2x^2 - 5x - 6$

Factorising and Solving

1) $x^2 - 8x + 15 = 0$ $x = 3 \ \& \ 5$

2) $4x^2 - 49 = 0$ $x = \pm\frac{7}{2}$

3) $6x^2 + 7x - 3 = 0$ $x = \frac{1}{3} \ \& \ -\frac{3}{2}$

Algebraic Fractions

1) Simplify $\frac{6x^2+x-1}{4x^2-1}$ $\frac{3x-1}{2x-1}$

2) Simplify $\frac{x+3}{4x} + \frac{x-2}{x+1}$ $\frac{5x^2-4x+3}{4x(x+1)}$

3) Solve $\frac{x-2}{5} + \frac{2x-3}{x} = \frac{8}{5}$ $x = \pm\sqrt{15}$

Quadratic Formula

1) $x^2 + 7x - 3 = 0$ $x = 0.41 \ \& \ -7.41$

2) $2x^2 + 3x - 1 = 0$ $x = 0.28 \ \& \ -1.78$

3) $x = 4 - x^2$ $x = 1.56 \ \& \ -2.56$

Completing the Square

1) $x^2 + 8x + 2 = 0$ $x = -4 \pm \sqrt{14}$

2) $2x^2 + 8x - 3 = 0$ $x = -2 \pm \sqrt{\frac{11}{2}}$

Iterations

$x_{n+1} = \frac{(x_n)^3-3}{8}$ and $x_1 = -1$

$x_2 = -0.5$

$x_3 = -0.390625$

Simultaneous Equations

1) Two sandwiches and a juice cost £3.40. Four sandwiches and three juices cost £7.20. What is the cost of a sandwich. $s = £1.50 \ \& \ c = 40p$

2) Solve: $y = x + 4$
$y = x^2 + 4x$
$x = -4, y = 0 \ \& x = 1, y = 5$

3) Solve: $x^2 + y^2 = 34$
$y = x + 8$
$x = -3, y = 5 \ \& \ x = -5, y = 3$

Quadratic Sequences

Find the nth term:

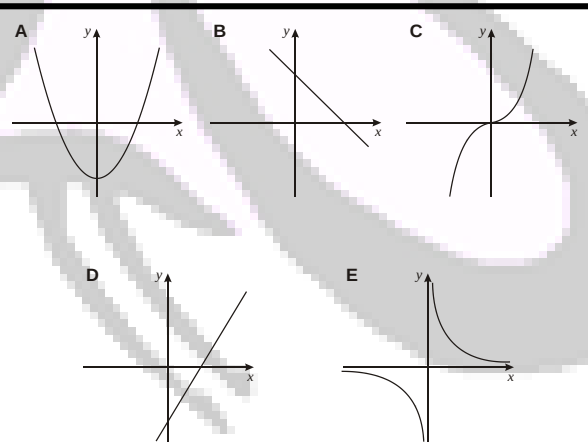
1) -2, 2, 10, 22, 38
$2n^2 - 2n - 2$

2) 3, 15, 33, 57, 87
$3n^2 + 3n - 3$

Types of Graphs

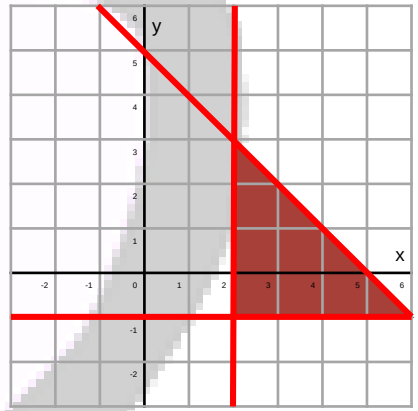
Match the equation to its graph:

Graph (letter)	Equation
B	y = 2x – 5
E	$y = \frac{5}{x}$
C	$y = 2x^3$
A	$y = x^2 - 6$
D	y = 7 - x



Solving Inequalities

1) Show the region satisfying x > 2, y > - 1 and x + y < 5



2) $2x + 4 < x - 3$ $x < -7$

3) $x^2 - 7x + 12 \geq 0$ $x \leq 3 \ \& \ x \geq 4$

Rearranging Formulae

Make a the subject of the formula:

1) F = ma $a = \frac{F}{m}$

2) v = u + at $a = \frac{v-u}{t}$

3) ab + c = bc – a $a = \frac{bc-c}{b+1}$

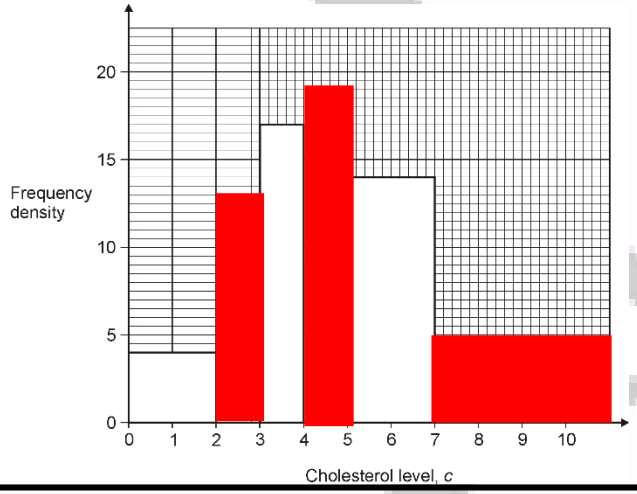
Data Handing Revision Mat

Histograms

The table and histogram show some information about the cholesterol level in the blood of 100 hospital patients.

Cholesterol level, c	Frequency
$0 < c \leq 2$	8
$2 < c \leq 3$	13
$3 < c \leq 4$	17
$4 < c \leq 5$	19
$5 < c \leq 7$	28
$7 < c \leq 10$	15

1) Use the table to complete the histogram.
2) Use the histogram to complete the table.



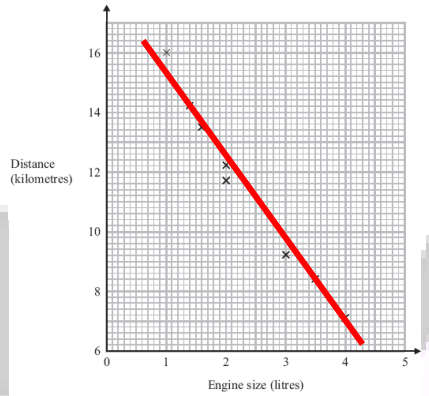
Capture/Recapture Method

A park ranger wants to estimate the number of fish in a lake. She catches 400 fish. She marks them with ink and puts them back in the lake. The next day she catches 60 fish. There are 3 marked with ink.
The ranger says, "There are about 8000 fish in the lake." Show that she is correct.

$$\frac{400}{8000} = \frac{3}{60}$$

Scatter Graphs

The scatter graph shows some information about 8 cars.



What type of correlation does the scatter graph show?

Negative

A car has an engine size of 2.5 litres. Estimate the distance travelled on one litre. 11

Averages from Tables

Bob asked each of 40 friends how many minutes they took to get to work.
The table shows some information about his results.

Time taken (m minutes)	Frequency		
$0 < w \leq 10$	3		
$10 < w \leq 20$	8		
$20 < w \leq 30$	11		
$30 < w \leq 40$	9		
$40 < w \leq 50$	9		

1) Write down the modal class. $20 < w \leq 30$

2) State the class in which the median lies.
$20 < w \leq 30$

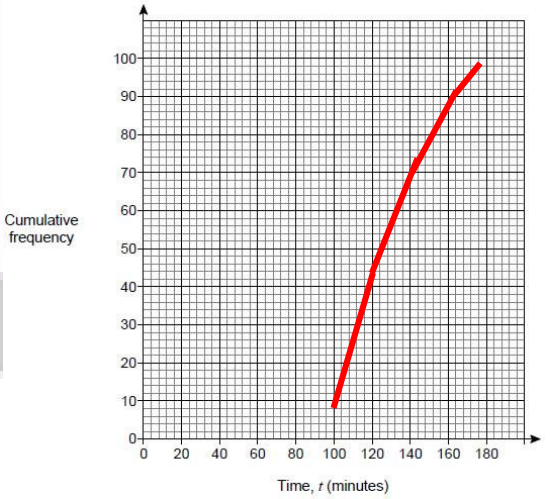
3) Work out an estimate for the mean time taken.
$\frac{1130}{40} = 28.25$

Cumulative Frequency Graphs

The table shows the running times of some films.

Time, t (minutes)	Number of films	
$0 \leq t < 80$	0	0
$80 \leq t < 100$	9	9
$100 \leq t < 120$	35	44
$120 \leq t < 140$	30	74
$140 \leq t < 160$	18	92
$160 \leq t < 180$	8	100

1) Draw a cumulative frequency graph on the grid to represent the data.



2) Estimate the number of these films with a running time of less than 2 ½ hours. 86

3) The shortest film was 84 minutes long. The longest film was 179 minutes long. Use this information to draw a box plot below.

Number Revision Mat

Indices

Simplify the following:

1) $a^6 \times a^3 = a^9$
2) $b^5 \div b^3 = b^2$
3) $d^0 = 1$
4) $(c^2)^4 = c^8$
5) $3a^4 \times 3a^{-2} = 9a^2$
6) $\frac{6a^4b^3}{2ab} = 3a^3b^2$
7) $f^{-4} = \frac{1}{f^4}$

Work out the value of:

1) $81^{1/2} = 9$
2) $16^{3/2} = 64$

Standard Form

Write as ordinary numbers:

1) $2.6 \times 10^2 = 260$
2) $8.65 \times 10^{-3} = 0.00865$

Write in standard form:

3) $0.345 = 3.45 \times 10^{-1}$
4) $46700 = 4.67 \times 10^4$
5) $1.6 \times 10^3 \times 3.8 \times 10^3 = 6.08 \times 10^6$
6) $(2 \times 10^{-4}) \div (5 \times 10^3) = 4 \times 10^{-8}$
7) Each day there are eight million cash withdrawals from 32000 cash machines. What is the average number of withdrawals per machine per day? 250

Simplifying Surds

1) $\sqrt{8} = 2\sqrt{2}$
2) $\sqrt{125} = 5\sqrt{5}$
3) $\sqrt{147}$ $7\sqrt{3}$
4) $\sqrt{24} \times \sqrt{6} = 12$
5) $4\sqrt{27} \times 6\sqrt{3} = 216$
6) $\frac{6\sqrt{160}}{3\sqrt{10}} = 8$
7) $(5 + \sqrt{3})(6 + \sqrt{3}) = 33 + 11\sqrt{3}$
8) $(6 + 3\sqrt{3})(6 - 3\sqrt{3}) = 63$

Rationalising the Denominator

1) $\frac{5}{\sqrt{2}} = \frac{5\sqrt{2}}{2}$
2) $\frac{9}{\sqrt{3}} = 3\sqrt{3}$
3) $\frac{5}{2\sqrt{5}} = \frac{\sqrt{5}}{2}$
4) $\frac{8}{2-\sqrt{5}} = -16 - 8\sqrt{5}$

Limits of Accuracy

These numbers have been rounded to the nearest hundred. Write down the upper and lower limits:

1) 300 250 & 350
2) 2700 2650 & 2750

These numbers have been rounded to the nearest whole number. Write down the upper and lower limits:

3) 3 2.5 & 3.5
4) 17 16.5 & 17.5

These numbers have been rounded to one decimal place. Write down the upper and lower limits:

5) 6.2 6.15 & 6.25
6) 15.9 15.85 & 15.95

These numbers have been rounded to one significant figure. Write down the upper and lower limits:

7) 30 25 & 35
8) 9 8.5 & 9.5
9) 0.02 0.015 & 0.025
10) 0.8 0.75 & 0.85

Bounds Calculations

1) Anthony measured the length and width of a rectangle. He measured the length to be 18cm correct to the nearest centimetre. He measured the width to be 10cm correct to the nearest 10 centimetres. Calculate the lower bound for the area of this rectangle. $17.5 \times 5 = 87.5cm^2$

2) A circular mirror has a diameter of 60cm to the nearest centimetre. Find the greatest possible area of the mirror. Give your answer in cm². $\pi \times \left(\frac{60.5}{2}\right)^2 = 2875cm^2$

3) Identical wooden sheds are displayed side by side along a straight wall in a builders' yard. The sheds are 270 cm wide, measured correct to the nearest 10 cm. The wall is 36 m long, measured to the nearest metre. How many sheds can the builders definitely display along the wall? $35.5 \div 2.75 = 12.\dot{9}\dot{0}$ so 12 sheds

Probability Revision Mat

Probability Essentials

1) An electronic game can show red or blue or green or yellow. The table shows the probabilities that the colour shown will be red or will be green or will be yellow. Arthur plays the game.

(a) Work out the probability that the colour shown will be blue.

Colour	red	blue	green	yellow
Probability	0.15	0.2	0.41	0.24

Janice is going to play the game 50 times.

(b) Work out an estimate for the number of times the colour shown will be yellow. 12

2) Josh plays a game with two sets of cards.

Set A | 1 | 2 | 4 | 5 | 7 |

Set B | 3 | 6 | 8 | 9 |

Josh takes at random one card from each set. He adds the numbers on the two cards to get the total score.

(a) Complete the table to show all the possible total scores.

Set A

Set B	1	2	4	5	7
3	4	5	7	8	10
6	7	8	10	11	13
8	9	10	12	13	15
9	10	11	13	14	16

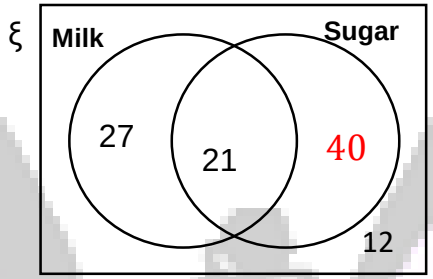
(b) What is the probability that Josh's total score will be greater than 12? $\frac{6}{20} = \frac{3}{10}$

Venn Diagrams

100 men who drink coffee were asked if they have milk and sugar in their coffee.

Some of the results are shown in the Venn diagram.

(a) Complete the Venn diagram.



(b) What is the probability that one of the men, chosen at random, has milk but no sugar in his coffee? 0.27

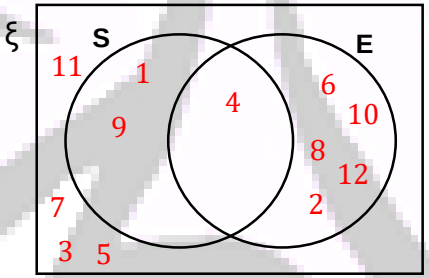
(c) What is the probability that one of the men, chosen at random, has no milk and no sugar in his coffee? 0.12

Set Theory

ξ = {1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12}

S = square numbers, E = even numbers

(a) Complete the Venn diagram.



One of the numbers is chosen at random.

(b) Write down P (S) $\frac{1}{4}$

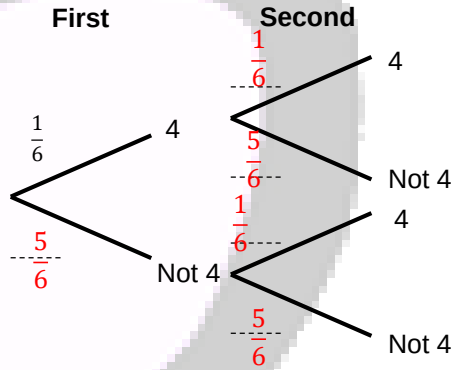
(c) Write down P (E') $\frac{1}{2}$

(d) Write down P (S ∩ E) $\frac{1}{12}$

Probability Trees

1) An ordinary fair dice is rolled.

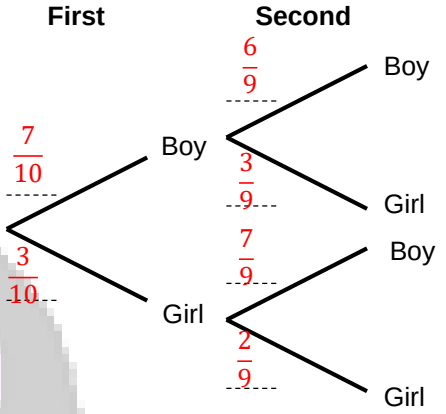
(a) Complete the tree diagram for the dice landing on the number 4.



(b) Work out the probability of the dice landing on 4 both times. $\frac{1}{36}$

2) A team has 7 boys and 3 girls. Stevie chooses two of the team at random.

(a) Complete the probability tree diagram.



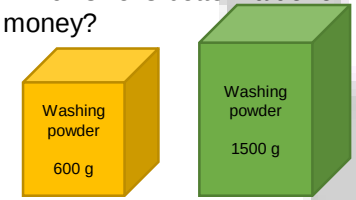
(b) Work out the probability that he chooses one boy and one girl. $\frac{21}{45}$

Ratio and Proportion Revision Mat

Applied Ratio

1) A drink is mixed in the ratio lemonade : orange : cranberry = 6 : 3 : 2. What fraction is orange? $\frac{3}{11}$

2) Washing powder is sold in two sizes, 600 grams and 1500 grams. Which size is better value for money?



£3.30

Was £9.60
Now 15% off

Small: $1.\dot{8}\dot{1}g/p$; Large: $1.838g/p$

3) Laura buys a saddle in the UK for £850. Delivery is free. Steve buys the same saddle from Holland for 990 Euros. He pays 15 Euros for delivery. £1 = 1.18 Euros. Including the delivery charge, whose saddle is cheaper? $990 + 15\ euros = £851.69$ so the answer is UK.

4) Here are the ingredients to make 8 biscuits. Work out the ingredients to make 20 biscuits.

75 g flour	187.5 g flour
50 g sugar	125 g sugar
40 g butter	100 g butter
2 egg yolks	5 egg yolks

Direct and Inverse Proportion

1) y is directly proportional to R^2. When R = 4, y = 24. Work out the value of R when y = 1350 30

2) y is inversely proportional to x^2 where x > 0. When x = 2, y = 20. Work out the value of x when y = 5 4

3) w is directly proportional to y. When y = 4, w = 14. Work out the value of w when y = 9 31.5

4) w is inversely proportional to x^2. When x = 2, w = 5. Work out the value of w when x = 10 0.2

Recurring Decimals

1) Which of these when converted to decimals are recurring decimals? Circle your answers.

$\frac{1}{3}$ π $\sqrt{3}$ $\frac{3}{16}$ $\frac{5}{7}$

2a) Show that $\frac{4}{9}$ is equivalent to $0.\dot{4}$ Divide…

b) Using part (a), or otherwise, write $0.9\dot{4}$ as a fraction. $n = \frac{17}{18}$

3) Convert $0.1\dot{7}\dot{2}$ to a fraction in its lowest terms. $\frac{171}{990} = \frac{19}{110}$

Compound Interest

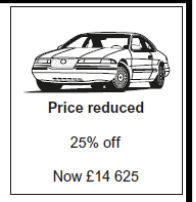
1) Loren puts £600 in a bank account. The account pays 3% compound interest each year. After one year she withdraws £200. How much will she have in the account after two years? £430.54

2) An amount of money was invested for 8 years. It earned compound interest at 2.5% per year. After 8 years the total value of the investment was £11 696.67. Tom is trying to work out the total interest earned. State what is wrong with Tom's method. Tom has calculated 8 lots of 2.5% of the final amount.

Interest for 8 years = £11 696.67 × 0.025 × 8

3) John bought a 2-year-old car for £ 12 000. Three years later he decides to sell the car; "I think that the value of the car is inversely proportional to its age". John estimates the value of the car using this idea. The actual value of the car depreciates by 20% each year. Work out the difference between John's estimate and the actual value. Difference: £1344

Reverse Percentages



1) Work out the price of the car before it was reduced. £19500

2) I increase a number by 24%. The answer is 6014. What number did I start with? 4850

3) In a sale the normal price of a dress is reduced by 25%. The sale price is then reduced by £10. The dress is now priced at £80. The manager says, "The price is now one-third less than the normal price." Show that he is correct. Original price: £120

4) Jane and Laura each have a meal. Jane pays £41.80 which includes a £4 tip. Laura also pays £41.80 which includes a 10% tip. Who pays the greater tip? Jane by $20p$

Exponential Growth and Decay

1) The population of Knapsford in 2010 was 3800 and is believed to be grow at a rate of 1.5% a year. Calculate the population of Knapsford in 2011 and 2012.

2010: 3857
2011: 3915

2) The population of a form of algae is believed to grow exponentially. On day 1 the population of algae was 2240. By day 4 it increased to 35000. Calculate the population of the algae by day 10.

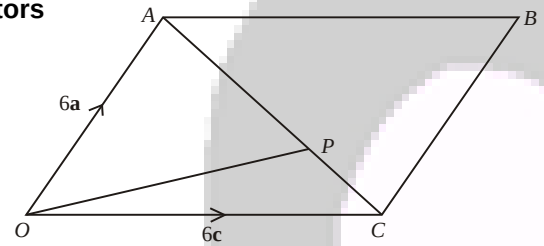
$2240x^{n-1}$

Day 4: $2240x^3 = 35000$ so $x = \frac{5}{2}$

Day 10: $2240 \times \left(\frac{5}{2}\right)^9 = 8544922$

Shape, Space and Measure Revision Mat

Vectors



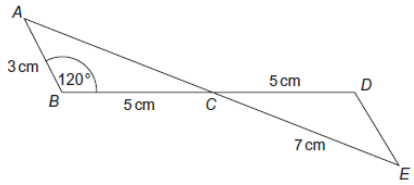
OABC is a parallelogram. P is the point on AC such that AP = $\frac{2}{3}$AC. $\underset{OA}{\rightarrow}$ = 6a, $\underset{OC}{\rightarrow}$ = 6c.

1) Find the vector $\underset{OP}{\rightarrow}$. Give your answer in terms of a and c. $2a + 4c$

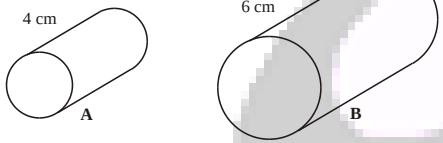
The midpoint of CB is M.

2) Prove that OPM is a straight line. $\overrightarrow{OM} = 3a + 6c$

Similarity and Congruence

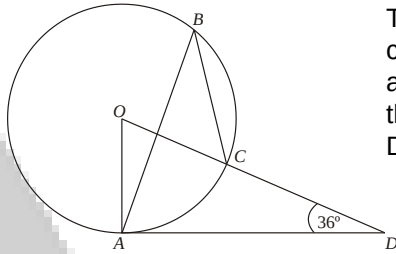


The straight lines AE and BD intersect at C.
Prove that triangles ABC and EDC are congruent.
Using cosine rule $AC = 7cm$, so we have SAS.



Cylinder A and cylinder B are mathematically similar. The volume of cylinder A is 80 cm³. Calculate the volume of cylinder B. $270cm^3$

Circle Theorems

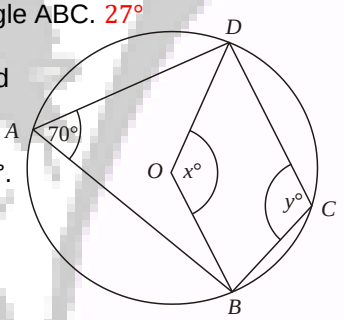


The diagram shows a circle centre O. A, B and C are points on the circumference. DCO is a straight line. DA is a tangent to the circle. Angle ADO = 36°

1) Work out the size of angle AOD. 54°

2) Work out the size of angle ABC. 27°

In the diagram, A, B, C and D are points on the circumference of a circle, centre O. Angle BAD = 70°. Angle BOD = x°. Angle BCD = y°.

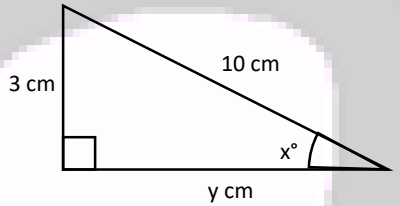


3) Work out the value of x. 140°

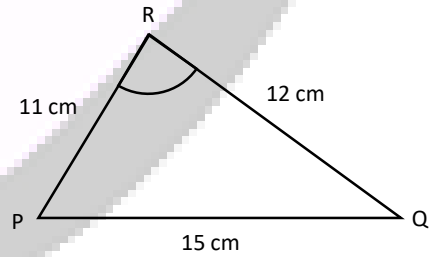
4) Work out the value of y. 110°

Pythagoras' Theorem and Trigonometry

1) Work out the value of x. 17.5°
2) Work out the value of y. $9.54cm$

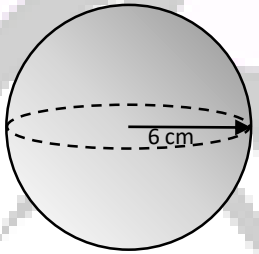


3) Use the cosine rule to calculate angle x. 81.3°
4) Find the area of triangle PQR. $65.2cm^2$

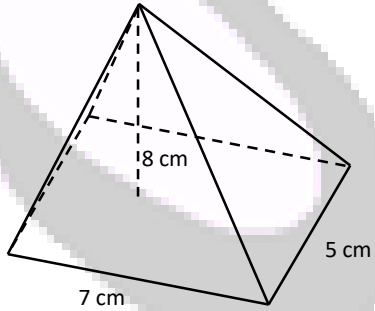


Volume of Pyramids and Spheres

Calculate the volume and surface area:



$288\pi = 904.8cm^3$



$93.\dot{3}cm^3$

$312\pi = 980.2cm^3$